252 Mortar and pestle or grinding slab and rub stone used in preparing different types plant food.
412 Mortars (pahal) included pit mortars, which were depressions 2-10 in. deep, 3-5 in. wide in level or gently sloping granite outcrops (Kroeber, [773] Handbook, 524, pl. 45). Manufacture of pit mortars attributed to Coyote, but fact recognized that mortar holes enlarged with use until at depth of 10 in. they became unusable.

412 Portable stone mortars (ku·pahal) from 6-35 in.
322 in total diameter; made by pecking out depression
324 in round soft gray stone with harder, pointed rock (SM). Small stone mortars readily transportable; taken on piñon expeditions. Large wooden portable mortars (ku·pahal) of Yokuts type (Kroeber, Handbook, 524, pl. 45) made from hard wood, oak (SM), juniper (FP); bowl burnt out and interior smoothed with rough rock. These latter "easier to make than stone mortars" and commonly used around home, but were too large to take on trips. Basketry hopper used. Pestles (poho'owal) for all types mortars were roughly cylindrical, granite or slate rocks, picked up in river beds, used as found; length of pestles varied from 5-20 in., width from 2 1/2-5 in., depending on size of mortar.

412 Grinding slab (mana·l) oval or roughly rec-
324 tangular piece of granite or black slate, from 14-20 in. long, 10-15 in. wide, and 2-4 in. thick; used on one side only; grinding surface flat or slightly concave. Suitable slabs fairly abundant in area, and woman always kept one such in house, leaning up against wall. With slab, either small ovoid rub stone (takibit) 3-4 in. long, about 3 1/2 in. wide, 2 in. thick, flat on top and bottom surfaces (Gifford and Schenck, 92, pl. 31), or larger stone of same shape (takin) used; these picked up in river beds. Long cylindrical mullers not used. When in use, grinding slab set up with flat rock, about 2 in. thick, placed under upper end of slab, so that slab slanted downward, away from operator. Lower end of slab rested on flat basketry tray.

412 All informants familiar with 3-legged metate
177 and horned muller (Steward, 1933, 341, pl. 5g),
252 because one such introduced among them by former Jesus Miranda, Mexican who married Petra Miranda, Tübatulabal woman; this metate used primarily for grinding corn (FP). However, present-day Tübatulabal ordinarily pound parched corn or wheat into meal in pit mortars, following older pattern.

252 Cooking techniques included stone boiling, boiling in clay pots, parching with live coals on basketry tray, parching in fire, roasting on coals, in ashes, in pit ovens, on spits, in fire. General pattern of native cookery, which resulted in economy of effort, was to apply heat only once to any variety of food intended to be eaten in cooked state. Thus small seeds which had already been parched, and previously roasted piñons, after they were ground into meal, were merely mixed with cold water when made up into gruel (u'u·gil); neither seed nor piñon meal recooked by stone boiling (or any other method), parched foods being

411 bow was 68 in., width at grip 1 3/4 in., at tips
3/4-in. SM denied that Tübatulabal formerly ever
[176] bowed in grip; FC very probably had introduced
this feature.

Boys used small plain willow bows and willow
[462] arrows "before they began regular hunting" (SM).
Bows, arrows made by men only.

Arrows.- War arrows (pa·hal) were 34-36 in. long, with wooden foreshaft (wawpit), some 8 in. long, made from hard wood set into cane mainshaft made from stalks of cane (paha·bĭ·l), same variety as that from which women obtained sweets (p. 19). Mainshafts also sometimes made from wood. Cane mainshaft (u·gat) straightened by being gently rolled at joints in round groove and over shallow incisions of heated stone arrow straightener (u·gišt). Mainshaft notched at upper end for insertion of bowstring; foreshaft split at end for insertion of arrowhead. War arrows had 3 vanes, square-trimmed, 1 in. wide, set on spirally and attached at each end with sinew; "if only 2 feathers were put on, the arrow didn't shoot straight, it went sideways" (SM). FC's arrows nevertheless had 2 vanes, set on spirally. Feathers from eagles, crows, owls,
● [324] 3 varieties of hawks among those used. Arrowheads (kĭyi·l) were flaked from obsidian (tu·gu··pĭl tĭnt, black rock), obtained near Mt. Whitney (SM); from bluish gray rock procured in mts. (SM), at Koso (FP); from a red rock (flint?) obtained near Tejon or on Mohave desert. Stone "cooked" first in fire, then broken into small
[412] pieces (FP). Deer-bone awl used to flake arrowheads; palm of left hand protected with piece of buckskin. Heads varishaped (fig. 7), "because some men liked this kind, some that" (ES), but all heads shouldered. Beautifully shaped head (fig. 7), 3 1/4 in. long, 1 in. wide at top, found by FC on old battlefield on Nichols peak, in s. border of Tübatulabal area; SM said this
[317] probably head for war arrow, as heads for such often 6 in. long(!). Asphalt (tu·šanat) used to set heads into foreshaft; no mention made of sinew lashings. Poison (pohil), source of which was unknown to informants, said to have been used on both war, hunting arrowheads (MM); only on hunting arrowheads (SM).

Hunting arrows (šu·mu·na·l), for use on large game, similar to war arrows save that they were 48 in. long, with 9-in. wooden foreshaft and were often tipped with smaller, black obsidian heads which were inserted rather loosely into foreshaft so that shaft fell out after animal was shot, leaving head firmly embedded; or if shaft did not fall out, it could be pulled out easily, head then cut out with stone knife.

Arrows of foregoing type used with sinew-backed bow; with willow bow cane arrows (šu·mu··na·l), 40 in. long, 2-3-vaned, tipped with wooden foreshaft, point of which had been sharpened by rubbing on rough rock, used to shoot rabbits, etc. For birds, shorter cane arrows with pointed

411
324

Fig. 7. Flaked artifacts from Andreas collection. a, white quartz strike-a-light, 1 5/8 in. long, 1¼ in. wide; b, c, obsidian arrowheads, 1¼ in. long, 5/8-in. wide at shoulders; d, red flint arrowhead, 1 in. long, 1¼ in. wide; e, arrowhead from Nichols peak (see text); f, g, h, red flint artifacts, lengths respectively, 3¼ in., 2 3/4 in., 1 7/8 in., widths at top, respectively, 1¼ in., 1¼ in., 1 in., either spearheads (FP), unfinished arrowheads (SM), or knife blades (?).

411 wooden foreshaft used; for waterfowl, cane arrows had sinew wrapped thickly around joint where foreshaft entered cane mainshaft, so as to produce bulge which made arrow skip over water in flight, similar to Owens Valley Paiute arrows for ducks (Steward, 1933, 261, fig. 3d). Specimen 1-19809 consists in part of 2 unfeathered arrows with cane mainshafts 46 in. long, foreshafts 4 1/2 in. and 2 in. long; such arrows might have been used by boys or else are simply, as collector has noted, very poor specimens.

[171]

415 Quiver.- Sacklike quiver (ma·šat, also term for sack), made from whole untanned antelope, coyote, or wildcatskin with hair left on; men going hunting carried quiver in carrying net,

[p. 28(b)]

415 which was used later to pack back deer; if going to war, man carried quiver slung over left shoulder and tied under right arm with twine.

411 Arrow release.- Man shot either standing or kneeling; if kneeling, weight rested on left knee, which touched ground; squatting position (Kroeber, Handbook, 822, pl. 78) never assumed for shooting (SM). When standing man held bow perpendicularly; if kneeling, horizontally; primary release used in both positions (SM).

Spear.- Although SM denied spears used in warfare, MM, FP both said they were, the spear (ku·yi·l, FP) being a 4-ft. shaft of any sort of hard wood, tipped on end with an obsidian head some 10-12 in. long (MM). This head was "sharp on both edges" (FP); what may have served as spear heads are shown in outline (fig. 7f-h), although SM when shown the red flint originals, from the collection of Miss Shirley Andress, said they were unfinished arrowheads.

TOOLS

412 Knife.- Knives (pigat) used for skinning large
● 324 game, etc., flaked from obsidian or red quartz;
[171] 18 in. (?) long, unhafted, similar in shape to Owens Valley Paiute knife (Steward, 1933, 261, fig. 3i). General utility knife (same term), used for cutting buckskin, shaping bow, etc., consisted of flaked obsidian blade about 5 in. long, set in wooden handle; similar to Owens Valley Paiute knife (Steward, 1933, 261, fig. 3j), except that Tübatulabal set blade in handle with asphalt, did not lash it with sinew. Hafted knives aboriginal (SM).

[171 317]

Adz, wedge, maul.- Informants could give no information on adz, wedge, or maul; presumably these lacking. SM did not know whether trees ever felled, and if so, how; stone axe apparently lacking. Holes in wooden mortars made by burning out wood; stone mortars chipped out; "the gray stone was soft" (SM).

412 Scraper.- Entire lower leg bone of deer used as scraper (iši·bišt) to dehair skins.

Awl.- In sewing moccasins, sacks, quivers, etc., and in flaking arrowheads, knife blades, an awl (niŋa'adol) similar to Miwok awl (Kroeber, Handbook, 806, fig. 67h) used; this awl about 4 in. long, made from leg bone of deer topped with lump of asphalt; when used, strip of buckskin (ma·pu·ništ) wound around palm of right hand; this awl essentially man's tool.

[171] [317] [462]

Women used smaller awl (wīŋabĭt), shaped like man's awl, but made from spine of barrel cactus (kĭše'apĭl) *surmounted with small lump of asphalt*, when making coiled baskets.

372 Fire drill.- Hearth (a·da·wa·yat) for fire-drill made from piece of dry cottonwood root (utu·lan wi·šin) from Populus fremontii; single hole in hearth; powder drained into channel leading to edge of hearth. Drill (a·da·wa·yišt) 2-2 1/2 ft. long, made from stalk of Baccharis glutinosa Pers. or B. viminea DC. Shredded cottonwood roots used for tinder.

413 Arrow straightener.- Arrow straightener (u·gišt) similar to Cahuilla straightener [171] (Kroeber, Handbook, 530, pl. 49d); made from soft rock (steatite?; slate, FC), obtained near ● 324 Chimney canyon in Tübatulabal area. Central groove (loho·wi·nil) and incised lines on top surface of straightener cut with flint knife. [171] SM's straightener, duplicate of steatite specimen from s. San Joaquin valley (Gifford and Schenck, pl. 17o), 3 in. long, 1 1/2 in. wide, 1 1/2 in. high at center, 1 in. wide at ends; single transverse groove 1/2 in. deep cut across top center, dividing convex top surface into 2 halves. Series of diagonal parallel lines, incised to depth of 1/16 in., cover one of halves of top surface; on other half series of 11 short parallel ridges cut out in low relief; incised lines and serrated ridges used for same purpose [171] as noted among Yokuts (Kroeber, Handbook, 530). FC's straightener round, with 2 grooves; lacked incised lines, ridges; specimen 1-19802, 4 in. long, 1 1/2 in. high, has single groove, no lines; specimen 1-19803 is 4 in. long, 1/2 in. high, has 2 grooves; SM said some little individual variation in size, markings on straighteners, depending on man's preferences.

413 Netting shuttle.- No information obtainable;
286 SM thought some variety of shuttle formerly used.

FIRE

221 In winter, small fire inside dwelling served for cooking, heating, and lighting house at night;
372 in summer, cooking fire often built outside un-
373 der shade. Women also often cooked acorn mush at spot where they leached meal. During summer hand games played at night around fire, outside in open; brush enclosures illuminated at night by fire built in center; sweat house heated, illu-[756] minated by open fire. Shamans used small open fire during shooting contests. Torches used for hunting quail (p. 13), but not for lighting.

372 Firemaking.- Fire made by men only, with simple hand drill (supra); man knelt (Kroeber,
462 Handbook, 822, pl. 78); SM said it took from
177 15-20 minutes to make fire with drill, but this seems unlikely. In 19th century Tübatulabal learned to make fire from Mexicans by striking upper edges of 2 white quartz strike-a-lights (ki·li·l) together (fig. 7a); "the Mexicans used one of these pieces of stone against a piece of

as thick as thumb laid around upturned edge of circular base and one roll after another used to build up side of pot as among Yokuts (Gayton, 1929, 242). Inside and outside of pot smoothed with fingers only (SM, FP); twig, chip, or acorn husk "might have been used a little" (FP), but small polishing stone such as Yokuts employed (ibid., 243) not used, nor were fingers dipped in syrupy substance while smoothing pot as among Owens Valley Paiute (Steward, 1933, 267). After pot shaped and smoothed it was sun-dried and then put on "a blazing fire made from any kind of wood"; pot allowed to get "red hot" (FP); firing caused clay to turn gray-black (SM, FP). After cooling, pot ready for use; coating acorn mush (Gayton, 1929, 245) not given it. SM had seen Tübatulabal pots shaped like middle and right-hand specimen in upper row of Yokuts pots pictured in Kroeber's Handbook, 530, pl. 51, but had never seen incised lines, such as those on Yokuts specimen, on any Tübatulabal pottery.

Pots were used for boiling meat, small game, whole piñons and buckeye nuts, tobacco stalks; FP said that occasionally acorn mush cooked in them although it was usually stone boiled. Pottery pipes not made (SM), cane cigarette pipes being used for smoking; FC had seen old Koso woman make clay pipes for her own use. Little girls sometimes made crude unbaked (SM) clay dolls (a·na·wišti·l) from red clay; SM thought such to have been aboriginal; children also occasionally made animal figures of clay, baked them (Voegelin, 1935 b, 227). Although pottery generally made by women, MM as boy had tried to make pots, but his cracked when heated, whereas "old-time pots were so hard they wouldn't break if you threw them down or hit them with a rock" (MM).

Contiguous distribution of this type of pottery limited to a few Calif. and Great Basin tribes (Gayton, 1929, 248, fig. 3; Steward, 1933, 269).

Horn objects.- Mt. sheep horn used as container for pounded tobacco and lime (see section on Tobacco); spoons (ta·mil) "shaped like a kitchen spoon" were made from antelope horn, using base of horn for bowl; "men and women used spoons for eating acorn mush" (SM); PN denied use of spoons.

Steatite objects.- Stone olla, 3 ft. high, "carved out of rock," was mentioned by FM, who said his father had found it among boulders on hill behind Jesus ranch in South Fork valley 40 yrs. ago. FM could give no further details.

Small steatite bowls and tubular pipes with bird-bone mouthpieces (pl. 1a) used as part of rain doctor's outfit. Outfit pictured, now in possession of SM, inherited by him from his stepfather, Francisco Sasterray, Tejon Indian (probably Chumash); this makes these objects foreign importations among Tübatulabal; however SM said